

## CLAIMS:

1. Apparatus for packing products including:
  - 5 a vacuum packaging machine for performing a vacuum sealing operation on product packages,  
  
an upstream product information acquisition stage arranged to acquire information relating to one or more characteristics of products on a product packing line, and  
10 a pack opener arranged to open the mouth of each pack to a controlled extent based on information relating to products being packed acquired at the upstream product information acquisition stage, and to present the pack so that the products are delivered into the open packs which are then delivered into the vacuum packaging machine, or  
15 deliver the products into the open packs which are already at least partially entered into the vacuum packaging machine.
2. Apparatus according to claim 1 wherein the pack opener includes one or more parts which insert into the mouth of each pack and more to open the pack.  
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3. Apparatus according to claim 2 wherein the parts which insert into the mouth of each pack comprise fingers which insert into the mouth of each pack.
4. Apparatus according to any one of claims 1 to 3 wherein the product information  
25 acquisition stage is arranged to acquire any one or more of height information, width information, height and width information, height, width and length information, volume or shape information, or weight information, in relation to the products.
5. Apparatus according to any one of claims 1 to 4 including a sub-system for  
30 supplying packs to the packing apparatus sequentially as individual products approach the packing apparatus on a conveyor.

6. Apparatus according to any one of claims 1 to 5 including a sub-system for making the packs on-line to a length tailored to the size of individual products by cutting and sealing bags from tubular stock.
- 5 7. Apparatus according to any one of claims 1 to 6 including a sub-system for supplying on-line bags of two or more widths, to a width selected for the size of individual products.
8. Apparatus according to any one of claims 1 to 7 wherein the packs are plastic  
10 bags or sacks.
9. Apparatus according to any one of claims 1 to 8 also including two or more generally parallel conveyors arranged to deliver products of different sizes into the packs, by a lesser number of the conveyors for smaller products and a greater number  
15 of the conveyors for larger products.
10. Apparatus according to claim 9 comprising two parallel conveyors one of which is arranged to carry smaller products into the packs and both of which are activated to run in parallel to carry larger products into the packs.
- 20 11. Apparatus according to claim 9 including three or more generally parallel conveyors including a centre conveyor flanked on either side by one or more other conveyors.
- 25 12. Apparatus according to any one of claims 9 to 11 wherein the conveyors are arranged to deliver products into the packs by telescoping or moving forward into the packs to an extent dependent upon the size of the product, based on product size information previously acquired at the upstream product information acquisition stage.
- 30 13. Apparatus according to any one of claims 1 to 12 wherein the vacuum packaging machine includes a plurality of vacuum chambers each arranged to receive at least one unsealed product package and operable to perform an independent vacuum sealing

operation on the product package(s), each vacuum chamber having a longitudinal direction defined by a direction of travel of the respective product package(s) through the chamber, each vacuum chamber having therein a heat seal assembly for forming a heat seal across the product package(s) which extends transversely to said longitudinal direction.

14. Apparatus as claimed in claim 13, wherein the machine includes vacuum chambers which are arranged generally vertically one above each other.

15. Apparatus as claimed in either one of claim 13 and 14, wherein the machine is configured to operate one of the vacuum chambers to perform the vacuum sealing operation while another of the vacuum chambers is open for loading and unloading of product package(s).

16. Apparatus as claimed in any one of claims 13 to 15, wherein a heat seal assembly in each vacuum chamber is located at or adjacent the end of the chamber adjacent the infeed conveyor(s), and the infeed conveyor(s) is/are configured to load the product package(s) into the chamber with the unsealed portion(s) of the package(s) trailing.

17. Apparatus as claimed in any one of claims 1 to 16, arranged to simultaneously unload a sealed product package from a selected vacuum chamber and while loading another unsealed product package into the selected vacuum chamber.

18. Apparatus as claimed in claim 17 including two vertically-stacked vacuum chambers, an infeed conveyor and an outfeed conveyor, the vacuum chambers being synchronously vertically moveable between a loading/unloading position adjacent and between the infeed and outfeed conveyor and an operating position spaced from the infeed and outfeed conveyor, the machine being operable such that as one vacuum chamber is performing the vacuum sealing operation, the other vacuum chamber is open for loading/unloading.

19. A method for packing products including:

acquiring information relating to one or more characteristics of products on a product packaging line,

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machine opening the mouth of each pack to a controlled extent based on information relating to one or more characteristics of the products being packed acquired at an upstream product information acquisition stage, and delivering or loading products into the open packs and then into a vacuum packaging machine or into the open packs which are already at least partially entered into the vacuum packaging machine.

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20. A method according to claim 19 including also opening each pack by inserting one or more parts of the pack opener into the mouth of each pack and moving said part(s) to open the pack.

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21. A method according to either one of claims 19 and 20 including acquiring via said product information acquisition stage, any one or more of height information, width information, height and width information, height, width and length information, volume or shape information, or weight information, in relation to the products.

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22. A method according to any one of claims 19 to 21 including supplying packs to the packing apparatus sequentially as individual products approach the packing apparatus on a conveyor.

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23. A method according to any one of claims 19 to 22 including making the packs on-line to a length tailored to the size of individual products by cutting and sealing bags from tubular stock.

24. A method according to any one of claims 19 to 23 including supplying online bags of two or more widths, to a width selected for the size of individual products.

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25. A method according to any one of claims 19 to 24 wherein the packs are plastic bags or sacks.

26. A method according to any one of claims 19 to 25 also including loading  
5 products of different sizes into packs, via two or more generally parallel conveyors, a lesser number of the conveyors for smaller products and a greater number of the conveyors for larger products.

27. A method according to any one of claims 19 to 26, including:  
10 providing a vacuum packaging machine having a plurality of vacuum chambers, each of the vacuum chambers being arranged to receive at least one unsealed product package and operable to perform an independent vacuum sealing operation on the product package(s), each vacuum chamber having a longitudinal direction defined by a path of travel of the respective product package(s) through the chamber, each vacuum chamber  
15 having a sealing assembly therein for forming a heat seal across product packages which extends transversely to said longitudinal direction;  
loading at least one unsealed product package into one of the vacuum chambers, such that the unsealed portion of the product package is located over the heat seal assembly or part of the heat seal assembly; and  
20 simultaneously with the loading operation, performing an independent vacuum sealing operation on at least one product package in another one of the vacuum chambers.

28. A method as claimed in claim 27, wherein the method includes, following a loading operation and a vacuum sealing operation, closing the recently-loaded vacuum  
25 chamber and performing a vacuum sealing operation on the product package(s) in that chamber, and substantially simultaneously with the vacuum sealing operation in the recently-loaded vacuum chamber, opening the recently-evacuated vacuum chamber and unloading the product package(s) from the recently-evacuated vacuum chamber and substantially simultaneously loading at least one unsealed product package into the  
30 recently-evacuated vacuum chamber.

29. Apparatus for packing products, including:

a vacuum packaging machine for performing a vacuum sealing operation on product packages,

- 5 an upstream product information acquisition stage arranged to acquire information relating to one or more characteristics of the products on a product packing line, and

two or more generally parallel load conveyors arranged to deliver or load products of different sizes into packs and into the vacuum packaging machine, by a lesser number  
10 of the conveyors for smaller products and a greater number of the conveyors for larger products.

30. A method for packing products, including:

- 15 acquiring information relating to one or more characteristics of products on a product packing line, and

delivering or loading products into packs and into a vacuum packaging machine via two or more generally parallel load conveyors, by a lesser number of the conveyors for  
20 smaller products and a greater number of the conveyors for larger products.